HISTORIC COLUMBIA RIVER HIGHWAY,
ONEONTA TUNNEL
Troutdale vicinity
Multnomah County
Oregon

HAER No. OR-36-L

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

HISTORIC COLUMBIA RIVER HIGHWAY, ONEONTA TUNNEL

HAER No. OR-36-L

Location:	Formerly carried the Historic Columbia River Highway, Multnomah Country, Oregon, through a rock outcropping immediately east of the mouth of Oneonta Gorge, beginning east of milepost 34.3.
	UTM: 10/572260/5048660 10/572300/5048670
	Quad: Multnomah Falls, Oreg.--Wash.
Date of Construction:	1914
Engineer:	Samuel Lancaster, Consulting Engineer for Multnomah County and Assistant State Highway Engineer, Oregon State Highway Department
Builder:	S. P. White and Co., Vancouver, Washington, contractor
Owner:	Oregon Department of Transportation
Present Use:	None; closed in 1948
Significance:	One of four tunnels on the Historic Columbia River Highway.
Historian:	Robert W. Hadlow, Ph.D., September 1995
Transmitted by:	Lisa M. Pfueller, September 1996

PROJECT INFORMATION

This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. The HAER program is administered by the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior. The Historic Columbia River Highway Recording Project was cosponsored in 1995 by HABS/HAER, under the general direction of Robert J. Kapsch, Ph.D., Chief, and by the Oregon Department of Transportation (ODOT), Bruce Warner, Region One Manager; in cooperation with the US/International Committee on Monuments and Sites (ICOMOS), the American Society of Civil Engineers (ASCE), and the Historic Columbia River Highway Advisory Committee.

Fieldwork, measured drawings, historical reports, and photographs were prepared under the direction of Eric N. DeLony, Chief of HAER; Todd A. Croteau, HAER Architect, and Dean A. Herrin, Ph.D., HAER Historian. The recording team consisted of Elaine G. Pierce (Chattanooga, Tennessee), Architect and Field Supervisor; Vladimir V. Simonenko (ICOMOS/Academy of Fine Arts, Kiev, Ukraine), Architect; Christine Rumi (University of Oregon) and Pete Brooks (Yale University), Architectural Technicians; Helen I. Selph (California State Polytechnic University, Pomona) and Jodi C. Zeller (University of Illinois, Urbana-Champaign), Landscape Architectural Technicians; Robert W. Hadlow, Ph.D. (ASCE/Pullman, Washington), Historian; and Jet Lowe (Washington, DC), HAER Photographer. Jeanette B. Kloos, ODOT Region One Scenic Area Coordinator; and Dwight A. Smith, ODOT Cultural Resources Specialist, served as department liaison.

Additional information about the Historic Columbia River Highway can be found under the following HAER Nos.:

OR-36	HISTORIC COLUMBIA RIVER HIGHWAY
OR-36-A	HISTORIC COLUMBIA RIVER HIGHWAY, SANDY RIVER BRIDGE AT TROUTDALE
OR-36-B	HISTORIC COLUMBIA RIVER HIGHWAY, SANDY RIVER BRIDGE (Stark St. Bridge)
OR-36-C	HISTORIC COLUMBIA RIVER HIGHWAY, CROWN POINT VIADUCT
OR-36-D	HISTORIC COLUMBIA RIVER HIGHWAY, CROWN POINT
OR-24	LATOURELL CREEK BRIDGE
OR-23	SHEPPERDS DELL BRIDGE
OR-36-E	HISTORIC COLUMBIA RIVER HIGHWAY, BRIDAL VEIL FALLS BRIDGE
OR-36-F	HISTORIC COLUMBIA RIVER HIGHWAY, WAHKEENA FALLS

	FOOTBRIDGE
OR-36-G	HISTORIC COLUMBIA RIVER HIGHWAY, WEST MULTNOMAH FALLS VIADUCT
OR-36-H	HISTORIC COLUMBIA RIVER HIGHWAY, MULTNOMAH CREEK BRIDGE
OR-36-I	HISTORIC COLUMBIA RIVER HIGHWAY, MULTNOMAH FALLS FOOTBRIDGE (Benson Footbridge)
OR-36-J	HISTORIC COLUMBIA RIVER HIGHWAY, EAST MULTNOMAH FALLS VIADUCT (Bridge No. 841)
OR-36-K	HISTORIC COLUMBIA RIVER HIGHWAY, ONEONTA GORGE CREEK BRIDGE
OR-36-M	HISTORIC COLUMBIA RIVER HIGHWAY, HORSETAIL FALLS BRIDGE
OR-49	MOFFETT CREEK BRIDGE
OR-36-N	HISTORIC COLUMBIA RIVER HIGHWAY, TOOTHROCK & EAGLE CREEK VIADUCTS
OR-36-O	HISTORIC COLUMBIA RIVER HIGHWAY, TOOTHROCK TUNNEL
OR-36-P	HISTORIC COLUMBIA RIVER HIGHWAY, EAGLE CREEK BRIDGE
OR-36-Q	HISTORIC COLUMBIA RIVER HIGHWAY, EAGLE CREEK RECREATION AREA (Forest Camp)
OR-36-R	HISTORIC COLUMBIA RIVER HIGHWAY, MITCHELL POINT TUNNEL & VIADUCT (Tunnel of Many Vistas)
OR-36-T	HISTORIC COLUMBIA RIVER HIGHWAY, MOSIER TWIN TUNNELS
OR-36-U	HISTORIC COLUMBIA RIVER HIGHWAY, MOSIER CREEK BRIDGE (Bridge No. 498)
OR-30	DRY CANYON CREEK BRIDGE
OR-27	MILL CREEK BRIDGE
OR-56	COLUMBIA RIVER HIGHWAY BRIDGES

For shelving purposes at the Library of Congress, Troutdale vicinity in Multnomah County was selected as the "official" location for the various structures in the Historic Columbia River Highway documentation project (HAER No. OR-36).

HISTORIC COLUMBIA RIVER HIGHWAY

The Pacific Northwest's Columbia River Highway, later renamed the Historic Columbia River Highway (HCRH), constructed between 1913 and 1922, is one of the oldest scenic highways in the United States. Its design and execution were the products of two visionaries: Samuel Hill, lawyer, entrepreneur, and good roads promoter and Samuel C. Lancaster, engineer and landscape architect; with the assistance of several top road and bridge designers. In addition, many citizens provided strong leadership and advocacy for construction of what they saw as "The King of the Roads."

Often, the terms "scenic highways" and "parkways" are used synonymously. Scenic highways are best described as those roads constructed to provide motorists with the opportunity to see up-close the landscape's natural beauty. Parkways are roads or streets often associated with city beautiful campaigns prevalent in the United States in the late 19th and early 20th centuries. They were part of a movement to create park-like settings out of wastelands. Many of the scenic highways in the United States are associated with the country's national park system and were built in the years following the First World War.

Beginning in the 1910s and early 1920s, the National Park Service (NPS) began construction of well-engineered paved roads with permanent concrete and masonry bridges and viaducts to make its park sites more accessible to an increasingly mobile tourist population. These included roads such as "Going-to-the-Sun Highway" in Glacier National Park and "All-Year Highway" in Yosemite National Park. The Historic Columbia River Highway, unlike many of its counterparts, was constructed through county-state cooperation. It became a state-owned trunk route or highway, part of a growing system of roads that criss-crossed Oregon.

Samuel Hill, once an attorney for James J. Hill and his large railroad empire, and later a Pacific Northwest investor and entrepreneur, was the state of Washington's most vocal good roads' spokesman in the late 19th and early 20th centuries. He promoted good roads at Seattle's Alaska-Yukon-Pacific Exposition in 1905, and shortly thereafter helped to establish the department of highway engineering at the University of Washington. With little success in convincing the Washington State Legislature to fund a major highway along the Washington side of the Columbia River, Hill found more receptive ears and pocketbooks with Oregon lawmakers and Portland area businessmen. Construction began on the HCRH in 1913. By 1922, it was complete, covered in a long-wearing and smooth-riding asphaltic-concrete pavement.[1]

Hill hired Samuel Lancaster, an experienced engineer and landscape architect to design the HCRH. Lancaster was noted for the boulevards that he created around Seattle's Lake Washington in the first decade of the 20th century as a component of the city's Olmsted-designed park system. In 1909 Lancaster became the first professor of highway engineering in Hill's department at the University of Washington. Lancaster had accompanied Hill and others to Paris in 1908 for the First International Road Congress, and afterwards the delegation toured western Europe to learn about continental road-building techniques. Seeing roads in the park-like setting of the Rhine River Valley inspired Hill to build a highway along the Columbia River Gorge. By 1912, Lancaster was conducting road-building experiments at Hill's estate, Maryhill, 100 miles east of Portland on the Washington side of the Columbia. The route they subsequently created was not a parkway, in the truest sense, but instead a scenic highway.[2]

The Columbia River Gorge's natural features distinguish it as the ideal setting. This relationship between the natural landscape and the Historic Columbia River Highway was described best by locating engineer John Arthur Elliott. He wrote, "All the natural beauty spots were fixed as control points and the location adjusted to include them." The road passed several waterfalls and rock outcroppings, including Thor's Heights (Crown Point), Latourell Falls, Shepperd's Dell, Bishop's Cap, Multnomah Falls, Oneonta Gorge and Falls, Horsetail Falls, Wahkeena Falls, and Tooth Rock. Natural features were made an integral component of the HCRH.[3]

According to Lancaster, "There is but one Columbia River Gorge [that] God put into this comparatively short space, [with] so many beautiful waterfalls, canyons, cliffs and mountain domes." He believed that "men from all climes will wonder at its wild grandure [*sic*] when once it is made accessable [*sic*] by this great highway." In addition, the promoters sought to create a route that utilized the most advanced techniques available for road construction. In reflecting on the work's progress, Lancaster acknowledged that because of the country's rugged climate, with its wind and rain and winter weather, it had been "slow and tedious and somewhat more expensive than ordinary work." Nevertheless, he and his associates felt they were accomplishing a worthwhile task because, "for if the road is completed according to plans, it will rival if not surpass anything to be found in the civilized world."[4]

In an more practical light, many observers saw the Historic Columbia River Highway as a lifeline connecting Portland with the many commercial and agricultural areas along the Columbia River. Some even envisioned it as part of a spider web of similarly constructed routes radiating out towards central and eastern Washington, and northern Idaho, meeting routes leading to other parts of the region and nation.

The Historic Columbia River Highway was a technical and civic achievement of its time, successfully mixing sensitivity to the magnificent landscape and ambitious engineering. The highway has gained national significance because it represents one of the earliest applications of cliff-face road building as applied to modern highway construction. Lancaster emulated the European styles of road building in the Columbia River Gorge, while also designing and constructing a highway to advanced engineering standards. Throughout the route, engineers held fast to a design protocol that included accepting no grade greater than 5 percent, nor laying out a curve with less than a 200' turning radius. In rare cases where a tighter curve was used, Lancaster reduced grades and widened pavement. The use of reinforced-concrete bridges, combined with masonry guard rails, guard walls, and retaining walls brought together the new with the old - the most advanced highway structures with the tried and tested. In building the HCRH, Lancaster artfully created an engineering achievement sympathetic to the natural landscape.[5]

In the days before the formation of a comprehensive state highway plan, Multnomah, Hood River, and Wasco counties cooperated, sometimes unwillingly, with the newly-formed Oregon State Highway Commission (1913) in constructing the Historic Columbia River Highway. Initially a group of recently elected Multnomah County commissioners, strong supporters of the proposed route, resolved that the highway commission take charge of its road building activities, with access to $75,000 in county tax revenues. Soon crews surveyed the route through Multnomah County and constructed one mile of road.

Boosters stumped for the route's completion to the Hood River County line. Local clubs sent out men and boys for weekend work parties to show public support for the undertaking. One photograph from the period, depicts work parties with picks and shovels in hand and placards such as "Gang No. 7, Portland Ad Club, Stalwarts," or "Gang No. 3, Portland Realty Board, We will ROCK the Earth." The highway received much patronage, although some citizens were less than enthusiastic about its construction. Opponents showed their views with placards declaring, "I WON'T WORK, To Hell With Good Roads, We Don't Own Autos." Many "mossbacks" had no use for good roads and were satisfied traveling the network of rutted, narrow, steeply-graded backwoods trails. Nevertheless, the public generally supported the highway's construction. Multnomah County Commissioners levied a direct tax sufficient to fund road building to the Hood River County line, and subsequently, the people voted a $1 million bond issue to pave the road with asphalt.[6]

Other counties similarly supported this scenic highway innovation. In 1914, Hood River County voters approved the sale of $75,000 in bonds to initiate their portion of the road's construction. Finally, in 1915, Wasco County commissioners financed a survey to locate the route through their jurisdiction. By 1916, though, the state highway commission was reorganized and given a greater mandate over state highway construction, taking much of it out of local hands. Passage of the Federal Aid Road Acts of 1916 and 1921 gave the Oregon State Highway Commission matching funding to complete the HCRH through Wasco County, and eventually to complete the route to its eastern terminus at Pendleton, in Umatilla County, by the early 1920s. At the same time, the state, working with counties west of Portland, completed another portion of the Columbia River Highway to the sea at Astoria. The entire route became part of the national highway system and was designated part of U.S. 30.[7]

By the late 1930s, construction of Bonneville Dam, a New Deal project aimed at providing flood control on the Columbia River and generating electricity, caused a realignment of a portion of the Historic Columbia River Highway near Tooth Rock and Eagle Creek, in eastern Multnomah County. It was evident that the old highway was too outdated to provide safe, efficient travel for modern motor traffic. By 1954 it was bypassed in its entirety from Troutdale to The Dalles by a new water-level route. This new road was subsequently upgraded to a four-lane divided roadway and eventually renamed Interstate 84. Only portions of the old route remained as a reminder of its early modern highway engineering accomplishments.

ONEONTA TUNNEL

The Historic Columbia River Highway's alignment from Crown Point, milepost 23.9, to Horsetail Falls Bridge, milepost 34.6, takes the highway along one of the largest concentrations of high waterfalls in North America. Near its eastern end lies Oneonta Creek and Gorge. The name "Oneonta," according to *Oregon Geographic Names*, originates in Oneonta, New York, and means "place of peace." The Oregon Steam Navigation Company ran a sidewheeler named *Oneonta* on the Columbia, above and below its cascades, in the 1860s and 1870s. Oneonta Creek and Gorge probably were named some time after the boat's construction.[8]

In 1914, the Multnomah County Road Department and Samuel Lancaster sought to align the route so that it brought travelers to the mouth of Oneonta Gorge, a canyon so narrow that its basalt walls almost touch as they rise two hundred feet above the creek. Subsequently, the county built Oneonta Gorge Creek Bridge (HAER No. OR-36-K). Carrying the alignment past a nearby 200' bluff, a continuation of the Oneonta Gorge, proved more difficult. In the 1880s the Oregon-Washington Railroad and Navigation Company (OWRN) had laid out its route along the Columbia River's south shore. Much of it was along the old Troutdale to The Dalles road begun in the 1870s. The OWRN's right-of-way crossed Oneonta Gorge Creek then passed through a narrow opening between the river and the bluff before continuing east. With the close proximity of the river and the cliff, there was no additional space to permit carrying the HCRH around the outcropping. Determined to include Oneonta Gorge and nearby Horsetail Falls as two of the natural beauty spots on the HCRH's route, Lancaster resolved this dilemma by having a tunnel bored through the outcropping.[9]

Plans stipulated creating an alignment that included a bridge over Oneonta Gorge Creek parallel and to the south of the railway span, and continuing east through the rock wall via a 125' tunnel. The Multnomah County Road Department called for bids in late 1913, and by the end of the year it had received contract proposals from 12 firms. Of these, S. P. White and Company of Vancouver, Washington, had the low bid of $30.00 per linear foot of excavation on the tunnel, with a 75¢ per cubic yard charge for enlargement. White's construction engineer, G. M. Pitts, had widespread construction experience on the West Coast and in the Intermountain regions of the United States. He had operated machinery in 1899-1900 on a tunnel for the Great Northern Railway, was concrete foreman in 1901-02 for the Montana Central Railway's Wicks Tunnel, in 1903-04 for the Great Northern's tunnel under Seattle, and in 1909-10 for the Milwaukee Railroad. He had most recently worked with the Pacific Bridge Company, which received contracts to construct many of the bridges built along the Multnomah County portion of the HCRH.[10]

DESIGN AND DESCRIPTION

The Oneonta Tunnel consisted of a 125' straight bore through a 200'-tall outcropping of Columbia River basalt. It measured 20' wide with a vertical clearance of just over 19' (a radius of 9'-10" measured at 9'-2½" from the floor). No written records document Oneonta Tunnel's construction chronology, but extensive information is available on how contractors bored Mitchell Point

Tunnel (HAER No. OR-36-R) and the Mosier Twin Tunnels (HAER No. OR-36-T), also on the Historic Columbia River Highway.[11]

At Oneonta, S. P. White Company most likely began work early in 1914. The material was Columbia River basalt, with frequent cleavage places, and commonly known as "dice" rock, because it broke up unto small fragments when it was blasted. The heading, or top portion of the bore was taken out first, followed by the bench. Blasting crews used extreme care when working near the outside wall. Because of natural conditions, they could only retain an 18' wall. Rock formations contained many large fissures. According to historian Oral Bullard, "The problem at the Oneonta Tunnel was that in order to prevent thousands of tons of rocks from cascading down into the railroad tracks when the blasting began it was necessary to go to considerable extra work to strengthen the cliff before digging into it." Lancaster devised a plan whereby White's crews injected concrete into crevasses in an attempt to stabilize the material.[12]

Cutting Oneonta Tunnel was a tedious process that involved the skill of an experienced explosives expert. The arrangement of blast holes, and the sequence of explosions, most likely using 40 percent dynamite and black powder, were the key to precise boring. At Mitchell Point, construction engineer John Arthur Elliott wrote that to ensure that crews did not collapse the outside wall,

> The lower outside lift hole was dropped one round back, leaving each time about 3' of the heading next to the thin wall, thus increasing the effective thickness of the outer wall. This lift hole was always one round behind until all danger of breaking out had been passed. . . . The firing order was controlled by varying the length of the fuses. Shorter fuses were used in the center, and cut holes and longer fuses in the lift holes. In this way, the center section was broken before the heavier charges in the lift holes exploded, which made the work of the lift holes easier. By holding the outside lift hole back one round, the necessity of breaking to a wall on both sides was eliminated, and the explosives broke out along diagonal lines converging towards the powder charges, which also made the heading easier to break.

At Mitchell Point, the contractor limited hole depth in the heading to 4'. Crews used 1½ sticks of 40 percent dynamite to spring each hole, followed by a per hole charge of 16 to 20 sticks of the dynamite. Each explosive round moved the bore along about 4½'.[13]

After detonating the charges, crews loaded the heading material into ore cars on tracks and dumped the material out the portals. Crews trimmed the roof with picks and hammers after each shot, and then pilled or stripped off the bench. They used two sticks of 40 percent dynamite to spring each hole and followed this with loads of 18 to 22 sticks. Crews loaded, or mucked out, the bench material in the same manner as the heading, dumping it out the portals.[14]

A photograph dated April 25, 1914 showing dozens of onlookers at Oneonta Tunnel's west portal also marks the progress of crews lining the tunnel with lumber sets and lagging. Samuel Lancaster wrote Multnomah County Roadmaster John B. Yeon in March 1914, urging construction of a lining for the tunnel because of frost action on the porous and seamed rock at Oneonta and ever present moisture. He worried about the safety of motorists who might receive serious injuries from falling rock inside the tunnel. In the 1910s and 1920s, most motorists would be vulnerable even inside their automobiles because most vehicles used soft collapsible tops.[15]

The S. P. White Company completed the Oneonta Tunnel during 1914 at a cost of $6,684.88. This included $4,140.00 for cutting the tunnel, $523.05 for excavating the portals, and $1,723.29 for 61,546 board feet of timbering. The tunnel, however, was not immediately opened to traffic. The Construction Company of Portland did not complete an 80' reinforced-concrete deck girder bridge over Oneonta Gorge Creek near the tunnel's west portal until later in the year.[16]

REPAIR AND MAINTENANCE

The Oneonta Tunnel served on the Historic Columbia River Highway from 1914 until 1948 when a highway realignment bypassed it. Maintenance records for the tunnel do not survive, but drawings from 1931 suggest that it was relined that year, most likely because the original timber sets and lagging had rotted from moisture penetration. A comparison of lining plans for Oneonta Tunnel and plans for the 1920-21 lining of the Mosier Twin Tunnels shows striking similarities. The new lining was probably a replication of the original construction. It consisted of 12" x 12" timber sets spaced 4'-0" on centers for the heading portion and 6" x 16" sets on 4'-0" centers for the vertical walls riding on 12" x 12" sills. The lagging consisted of 4" x 6" Douglas Fir boards laid horizontally. Up the vertical walls rode four 2" x 12" timber guard rails, spaced 18" on centers, and running the tunnel's length. Four 10" x 12" sets placed vertically at 1" spacing and four pairs of at least 12" x 12" stacked timbers placed horizontally above them formed the tunnel portals (an additional, or third timber was stacked above the outside-most set of headers). Finally, timber inclined endposts finished the wooden portion of the portals. A dry masonry wall dating from the tunnel's original construction, framed the wood. The 1931 plans called for extending the bottom two plank guard rails outside the portals at a 45° angle, running about 4' to connect with 12" x 12" posts as a continuation of standardized post and plank guard fences. These were never constructed.[17]

Oneonta Tunnel's lining reduced its clear dimensions. Its roadway width became 16'-9". Horizontal clearance at the curb line was about 10', and 16' at the centerline. By the mid-1930s, with greatly increased traffic volume, and larger vehicles, Oneonta Tunnel's vertical and horizontal clearances were too small to safely accommodate two-way traffic. In July 1936, the Oregon State Highway Department installed traffic activated one-way stop-and-go signals at the tunnel portals, temporarily solving the traffic safety problems. The department also installed similar signals at Mitchell Point Tunnel in 1938 and at the Mosier Twin Tunnels in the 1940s.[18]

Rock fall due to frost was a continual problem at Oneonta Tunnel. Chunks of basalt filled the cavity between the tunnel bore and the lining and dropped on the roadway at the portals. The greatest concern was the perennial covering of the OWRN (later Union Pacific Railroad) main line with rock tumbling off the cliff. Not only did it often close the track to traffic, it cumulatively weakened the outer tunnel wall, threatening eventual collapse and possibly burying the main line for an extended period. The Union Pacific also worried about a disastrous rock fall and track closure if one of its large articulated steam locomotives happened to derail near Oneonta Tunnel and slam into the cliff.

In 1948, the railroad saw an opportunity to end its worries about the tunnel by moving its trackage north of the cliff on fill dredged from the Columbia. This created room for the highway department to re-route the HCRH around the cliff, on the old railroad right-of-way. The state then mothballed the tunnel with fill to prevent continuous raveling and possible collapse. The highway department constructed a new bridge, on the old railroad span's original piers, as part of the realignment, and retained the old bridge and adjacent abandoned roadway as a parking area for travelers to Oneonta Gorge. In the subsequent four decades, vegetation has completely overtaken the Oneonta Tunnel portals, leaving many a person to ask why the old Oneonta Gorge Creek span is a bridge to nowhere.[19]

ENDNOTES

[1]For good syntheses of the Pacific Northwest good roads' movement, see John Kevin Rindell, "From Ruts to Roads: The Politics of Highway Development in Washington State" (M.A. thesis, Washington State University, 1987) and Hugh M. Hoyt, Jr., "The Good Roads Movement in Oregon, 1900-1920" (Ph.D. diss., University of Oregon, 1966); Oral Bullard, *Lancaster's Road: The Historic Columbia River Scenic Highway* (Beaverton, OR: TMS Book Service, 1982): 31; Ronald J. Fahl, "S. C. Lancaster and the Columbia River Highway: Engineer as Conservationist," *Oregon Historical Quarterly* 74, no. 2 (June 1973): 112.

[2]Fahl, "S. C. Lancaster and the Columbia River Highway," 105-07.

[3]John Arthur Elliott, "The Location and Construction of the Mitchell Point Section of the Columbia River Highway" (C.E. thesis, University of Washington, 1929): 3.

[4]Samuel C. Lancaster to Amos S. Benson, 7 February 1914, folder "Multnomah County, 1914," box 4, RG 76A-90, Oregon State Archives, Salem.

[5]Dwight A. Smith, "Columbia River Highway Historic District: Nomination of the Old Columbia River Highway in the Columbia Gorge to the National Register of Historic Places, Multnomah, Hood River, and Wasco Counties, Oregon" (Salem, OR: Oregon Department of Transportation, Highway Division, Technical Services Branch, Environmental Section, 1984): 3.

[6]Ronald J. Fahl, "S. C. Lancaster and the Columbia River Highway: Engineer as Conservationist," *Oregon Historical Quarterly* 74, no. 2 (June 1973): 111; Samuel C. Lancaster, "The Revelation of Famous Highways: A Symposium,"in *American Civic Annual* (n.p., 1929): 109.; see photograph in the Oregon Historical Society collection, negative no. 38744; C. Lester Horn, "Oregon's Columbia River Highway," *Oregon Historical Quarterly* 66, no. 3 (September 1965): 261.

[7]*Second Annual Report of the Engineer of the Oregon State Highway Commission* (Salem, 1916): 26-30.

[8]Lewis A. McArthur, *Oregon Geographic Names*, 6th ed., revised and enlarged by Lewis L. McArthur (Portland: Oregon Historical Society Press, 1992): 635.

[9]"The Columbia Highway in Multnomah County," by Samuel C. Lancaster, in *First Annual Report of the Highway Engineer* (Salem, OR, 1914): 65-66; Fred Lockley, *History of the Columbia River Valley, from The Dalles to the Sea* (Chicago: S. J. Clarke Publishing Co., 1928): 835-36.

[10]"List of Bidders on Oneonta Tunnel [with margin notes in the hand of S. C. Lancaster]," in "Columbia River Highway, Oneonta Tunnel, 1913-1915," 2/35, Mss 2607, Oregon Historical Society, Portland.

[11]See Drawing No. 4443, Oneonta Tunnel, Bridge No. 1759, Microfiched Drawing Files, Bridge Section, ODOT, Salem.

[12]H. M. White, "Oregon's State Highways," *Municipal Journal* (2 September 1915): 349-50; Lancaster, Samuel C. "The Columbia Highway in Multnomah County": 66; Oral Bullard, *Lancaster's Road: The Historic Columbia River Scenic Highway* (Beaverton: TMS Book Service, 1982): 42.

[13]Elliott, "The Location and Construction of the Mitchell Point Section of the Columbia River Highway": 29-30.

[14]Elliott, "The Location and Construction of the Mitchell Point Section of the Columbia River Highway": 31.

[15]See photo courtesy of Oregon Historical Society, negative no. 57753, in Bullard, *Lancaster's Road*, 57; Samuel C. Lancaster to John B. Yeon, 7 March 1914, in "Columbia River Highway, Oneonta Tunnel, 1913-1915," 2/35, Mss 2607, Oregon Historical Society, Portland.

[16]*First Annual Report of the State Highway Engineer* (Salem, 1914): 50.

[17]Drawing No. 4443, Oneonta Tunnel, Bridge No. 1759; and Drawing No. 1639, Mosier Tunnel, Bridge No. 653, in Microfiched Drawing Files, Bridge Section, ODOT, Salem. See the following photographs: "'Oneonta Tunnel,' Col. Highway, Ore.," Cross and Dimmitt negative no. 491 [ca. 1920]; Oneonta Tunnel and Bridge, Gifford negative no. 6510 [ca. 1925]; Oneonta Tunnel and Bridge, Hutchinson Collection, Manuscripts, Archives and Special Collections Division, Washington State University Libraries, Pullman, 1933; and Oneonta Tunnel and Bridge, James B. Norman, Environmental Services, ODOT, Salem, 1995.

[18]Drawing No. 4443, Oneonta Tunnel, Bridge No. 1759, Microfiched Drawing Files, Bridge Section, ODOT, Salem; Robert H. Baldock to Fred Johnson, American Smelting and Refining Company

[ASARCO],19 August 1948, from file "Tunnels," Office of General Files, ODOT, Salem, copy in "Historic Structure Report, With Revisions and Supplement to Appendix E, Mosier Twin Tunnels, Br. 00653, Wasco Co, June 6, 1994, [revised] September 27, 1994," by Glen Thommen, P.E., Foundation Engineer, Foundation Unit, Bridge Engineering Section, ODOT, Salem (hereafter cited as "Thommen Report."

[19]Robert H. Baldock to the Oregon State Highway Commission, 2 December 1954, in "Thommen Report."

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DATA LIMITATIONS

Because Oneonta Tunnel was a relatively nondescript structure at its construction, it received little press coverage except where noted in writings about the HCRH's construction through Multnomah County. Maintenance records for Oneonta Tunnel no longer exist since the structure was closed nearly fifty years ago, in 1948. Nevertheless, original construction drawings, combined with period photographic postcards by the Portland firm of Cross and Dimmitt, were of great help in understanding the structure.